

sutures, in which character it approaches *Nautilus* (*Herzoglossa*) *franconicus*, Oppel.

Horizon. Calcareous Grit and Kelloway Rock.

Localities. Wiltshire; Marcham, Berkshire (Calcareous Grit). Scarborough, Yorkshire (Kelloway Rock).

XL.—On the Dentition of *Pleuroplax* (*Pleurodus*), A. S.
Woodw. By JAMES W. DAVIS, F.L.S.

[Plate XIII.]

IN May 1879* I described the teeth and spines of *Pleuroplax* (*Pleurodus*) *affinis*, Agass., occurring in a thin shale above the Better-bed Coal of Clifton and Lowmoor, near Halifax. A comparison of these spines with similar ones from the Staffordshire Coal-field, in the cabinet of Mr. John Ward, of Longton, showed them to be closely related. In connexion with one of the Staffordshire spines were a few fragments of teeth, referred with probability to the genus *Helodus*, and the inference was drawn that the two genera had similar spines.

Mr. Ward has just issued an admirable account of the North Staffordshire Coal-field †, in which he refers to the occurrence of numerous teeth of *Helodus simplex*, Ag., in association with a spine much resembling that of *Pleuroplax*, the full description of which he reserves to a future time. Mr. Ward also describes a specimen in his collection from the Northumberland Low Main Coal of the jaw of *Pleuroplax Rankinei*, Ag. It "is somewhat in the shape of a horseshoe, with a blunt rounded extremity, the articular ends expanded. Both rami support teeth, several of which unfortunately are displaced. Those in position are arranged upon the jaw with the lateral expansions pointing antero-posteriorly. The anterior teeth are relatively narrower than the posterior. The most posterior tooth, at least, has the summit of the crown crenulated."

Recently, whilst on a visit to Glasgow with my friend Mr. A. Smith Woodward, we found two specimens of *Pleuroplax* which prove not only that the two genera had similar spines, but that they are one species with the same spine. One of the specimens is from the University Museum, Glasgow, and

* Quart. Journ. Geol. Soc. vol. xxxv. p. 181, pl. x. figs. 1-11.

† "The Geological Features of the North Staffordshire Coal-fields," by John Ward: Trans. N. Stafford. Inst. of Mining and Mechanical Engineers, vol. x. (1890).

has been lent to me by Professor John Young; and for the second I am indebted to Mr. James Thomson, of the same city. The former, represented on Pl. XIII. fig. 1, exhibits the anterior portion of the body of the fish; the head, consisting of a mass of cartilaginous or chondroid substance, occupies nearly one half of the part preserved. The mouth, with teeth scarcely at all displaced, is well defined, the mandible is large, the upper jaw is not so easily distinguishable from the other elements of the cranium; the anterior extremity of the snout is unfortunately absent, but sufficient remains to show that the head was large and broad. A hollow above the posterior teeth of the jaws may indicate the position of the orbit. The whole of the surface of the head, together with the remainder of the body, is covered with glistening dermal tubercles or shagreen. The teeth are numerous, and, so far as can be identified, are arranged in shark-like concentric rows. Those occupying the posterior surface of the jaws are the teeth hitherto known as *Pleurodus*, whilst the anterior teeth, far larger in number, are those styled *Helodus* or *Lophodus*. The front teeth are pointed and adapted for seizing and holding prey, whilst those behind gradually assume broader and more massive proportions, and apparently in the palatal teeth of the Pleurodont type there is evidence of the ankylosing of three or four teeth together. The teeth occupying a median position in the jaws have their longer axis in the same line as that of the jaw, with the result that the Lophodont or Helodont teeth present an external cutting-surface, which resembles, when a pair of teeth is taken separately, the dentition of some of the Petalodonts (fig. 1 *a*). The head viewed from the front side, where the matrix is fractured, is seen to be squeezed over towards the exposed surface, and the opposite rami of the jaws can be traced along the edge of the matrix. The length of the rami of the jaws is 0.03 m.; at a distance of 0.025 m. behind the extremity of the jaw is a spine which has apparently been displaced; it is 0.040 m. in length and 0.010 m. in breadth, and, pointing towards the head, the spine extends in a diagonal direction with the base towards the dorsal aspect of the fish. Its position appears to indicate that it was located immediately behind the occipital region of the head.

Mr. Thomson's specimen does not exhibit the teeth *in situ* in the jaws, but in a slightly segregated form on the slab; in this respect it forms an extremely valuable companion to the specimen already referred to, because the relative size and form of the teeth are better seen. There are six teeth exposed of the Pleurodont type and near sixty teeth may be counted

of the *Helodont* type. A representation of the slab is given on Pl. XIII. fig. 2, and drawings of the teeth, natural size and enlarged, are also given (figs. 2 a-2 g). The surface of all the teeth is enamelled and ornamented by minute punctures, indicating the superficial extremity of the nutritive canals.

These specimens are important as affording positive evidence of the structure of another group of *Cochliodonts*. Until the description of the dentition of *Psephodus magnus* by Traquair* was rendered possible by the discovery of the East-Kilbride specimen, very little reliable information respecting this family was accessible. The dentition of *Pleuroplax* as exhibited in these specimens confirms the opinion expressed by Traquair that the teeth of the genus *Lophodus* of Rowanowski were merely accessories in the dentition of other genera; and the statement of Sir R. Owen † in 1867, "that it would seem as if the several teeth of each oblique row in *Cestracion* had been welded into a single dental mass in *Cochliodus*," may well be applied to the whole of the family of the *Cochliodonts*; the broad palatal teeth of *Pleuroplax* clearly indicate that their present form and construction is due to the ankylosis of the smaller series of teeth possessing the *Lophodont* character which still remain separated in the anterior parts of the mouth.

The occurrence of the teeth of *Helodus* on the slab from the Staffordshire Coal-field in conjunction with the spine of *Pleuroplax*, referred to in my paper ‡ on *Pleurodus affinis*, seems to point to the inference that *Helodus simplex* must also be considered a *Lophodont* and absorbed in other genera. This view is confirmed by Dr. Traquair §, who has pointed out that "a fine series of specimens of *Helodus simplex*, Ag., in the collection of Mr. John Ward, F.G.S., Longton, clearly shows that the teeth in this species have the form of '*Lophodus*,' that the entire dentition consisted of teeth generally similar in shape, and that the dorsal fins were armed with spines resembling those of *Pleurodus*." Mr. A. Smith Woodward || restricts the genus *Helodus* to the type species *H. simplex*, Ag., "a genus still awaiting elucidation." He regards it as closely related to *Pleuroplax* both by the dentition and the dorsal fin-spine, and has no doubt that, in what-

* Geol. Mag. dec. iii. vol. ii. p. 340, pl. viii. (1885).

† Geol. Mag. vol. iv. p. 59.

‡ *Op. cit.* p. 182.

§ Geol. Mag. dec. iii. vol. ii. p. 344, 1885 (footnote), and vol. v. p. 84, 1888.

|| 'Catalogue of the Fossil Fishes in the British Museum,' part. i. p. 171 (1889).

ever family *Pleuroplax* be placed, the type species of *Helodus* must follow. The difficulty in associating the two genera is stated by Woodward to be that "in all known examples of the last-named genus (*Pleuroplax*) all the teeth are described as fused into plates, while in the typical *Helodus* no such arrangement has been discovered." This difficulty is removed by the discovery of the examples now figured.

EXPLANATION OF PLATE XIII.

Fig. 1. Anterior portion of body with head of *Pleuroplax*, showing position of mouth with teeth *in situ*, nat. size.

Fig. 1 a. Front view of the same specimen, exposed on margin of slab.

Fig. 1 b. Teeth from the median portion of the upper and lower jaw in juxtaposition, enlarged 4 diam.

Formation and Locality. Shale under the Drumgray Coal, Airdrie.
Ex Coll. Rankine Collection, University Museum, Glasgow.

Fig. 2. Group of teeth of *Pleuroplax*.

Fig. 2 a. Large posterior tooth, enlarged 2 diam.

Fig. 2 b. A second example, also from posterior part of jaw, $\times 2$ diam.

Fig. 2 c. External and lateral aspect of a median tooth, with the former magnified 2 diam.

Fig. 2 d. External and surface aspects of a median tooth, $\times 2$ diam.

Fig. 2 e. A tooth with deep root, $\times 3$ diam.

Fig. 2 f. Side view of a tooth similar to *fig. 2 c.*, $\times 3$ diam.

Fig. 2 g. An example of a more elongated or attenuated tooth, $\times 3$ diam.

Fig. 2 h. Tooth with a prominent crown; the lateral extension of the base greatly prolonged on one side, very short on the opposite one, $\times 3$ diam.

Formation and Locality. Black-band Ironstone, Airdrie.

Ex Coll. James Thomson, Esq., F.G.S.; private collection.

XLI.—*Evidence of a Fossil Tunny from the Coralline Crag.* By A. SMITH WOODWARD, F.G.S., F.Z.S.

M. RAYMOND STORMS, of Brussels, who has long been engaged in studying the osteology of the Scomberoid Fishes, has lately published* some interesting observations on the vertebral column of the typical genera of that family, resulting in the determination of a series of large fossil vertebræ from the Scaldisian Pliocene formation in the neighbourhood of Antwerp. These fossils indicate a fish of very large size, and agree precisely with the corresponding vertebræ of

* R. Storms, "Sur la présence d'un Poisson du genre *Thynnus* dans les Dépôts Pliocènes des Environs d'Anvers," Bull. Soc. Belge Géol., Paléont., Hydrol., vol. iii. (1889), pp. 163-178, pl. vii.